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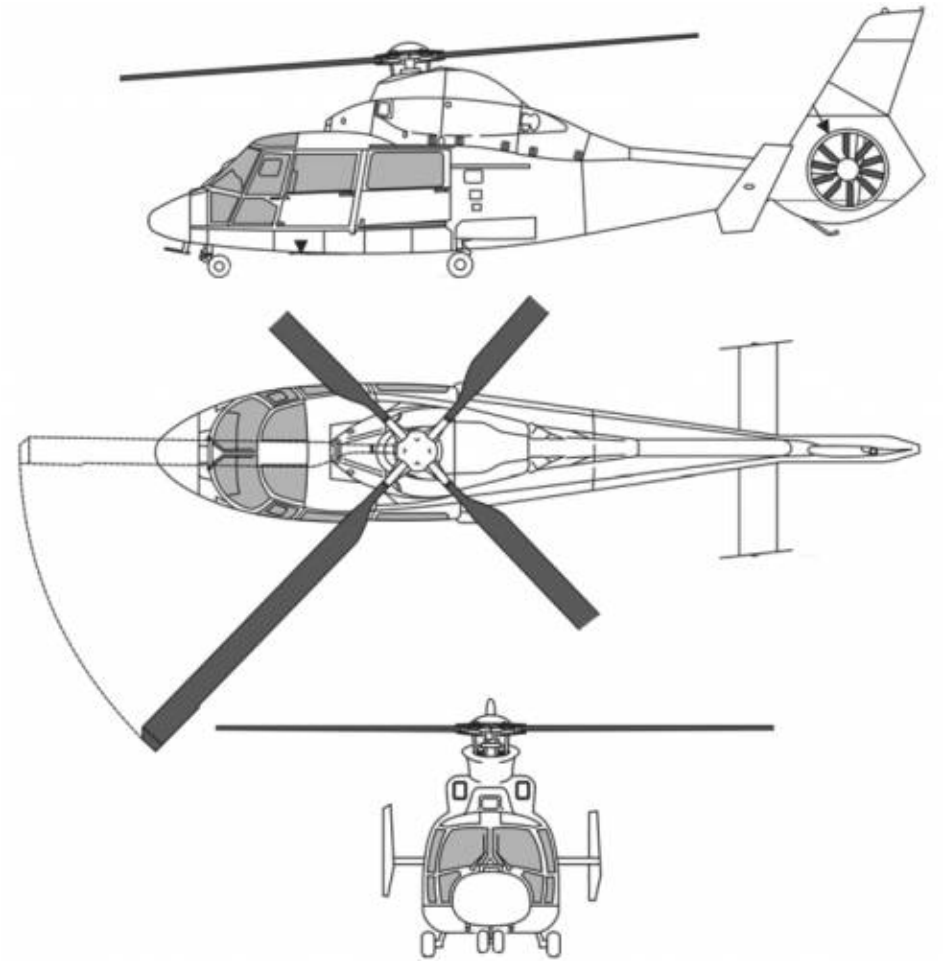
INSTRUCTION: TN02874
Rev. -
Approval: Bob Krueger

Aircraft: EC155
Engine: Arriel 2C2



Heli-Preheat System
Installation Instruction

Contents

Revision History

Date	Level	Description	By
09/23/2011	-	Initial Release (First fitting)	Dirk Ellis

Section 1. Introduction

These instructions are provided as guidance only. Final judgment regarding the proper installation and inspection details is the responsibility of the installing mechanic and inspection authority releasing the aircraft for service. Should other aircraft modifications require departure from these installation procedures, it becomes the installing agency's responsibility to obtain separate approval for the deviation. Contact Tanis engineering for design change approvals as needed (800-443-2136).

The installer must read this installation manual and become familiar with all processes, and resolve any conflicting issues before proceeding with the installation.

Section 2. Installation Requirements

The retrofitting of this aircraft with the Tanis Heli-Preheat System is complex and is to be accomplished by competent, appropriately rated and certified mechanics with airframe and power plant experience in the type of aircraft for intended installation.

Installation is to be in compliance with Federal Aviation Administration regulations (AC43.13-1b Chapters 3, 4 and 11), airframe manufacturer's procedures, and approved procedures set in place by the installing authority.

The complexity of the installation requires access to various stations throughout the aircraft which include clear access to engine(s) and/or accessories. The installation is best performed in an environment that is in equilibrium with standard room temperatures between 18°C (65°F) and 27°C (80°F).

Installation times vary depending on shop procedures, installation options and other modifications.

Section 3. Specifications

3-1. Power. The Tanis Preheat System is powered by alternating current (AC) shoreline power and is not used in flight, voltage requirements are identified by power plug type, placards, and Flight Manual Supplements. North American systems operate on 115-Volt, European systems 230-Volt. Power plug types and locations vary depending on voltage, mounting options, and country of origin.

Heli-Preheat Systems provide preheating for the engine accessory and reduction gearboxes, main and tail rotor gearboxes, oil and hydraulic tanks.

3-2. Options. Aircraft operated in below freezing conditions are advised to consider the addition of insulated engine/cowl covers, as well as, battery and avionics preheat. When operating at -12°C (10°F) and below, most flight departments require the use of these items. Insulated covers enhance preheating operation retaining heat and acting as a windbreak. Preheating flight deck avionics, displays and gyros, reduces condensation, corrosion, gyro wear, and cold weather-induced avionic errors. Preheating of aircraft batteries eliminates freeze point depression. This condition causes unheated batteries to lose their load function and ability to receive a charge. Flight departments with special operational concerns are encouraged to contact Tanis Aircraft (800-443-2136).

3-3. Electrical System. Reference **Table 3-1. System Values.**, and Heli-Preheat System wire diagram drawing (02875).

TABLE 3-1. System Values.

TC02874, EC155 ARRIEL 2C2

115-Volt Quantity	Element	Wattage each	Wattage total	Ohms of resistance each	amps
1	TE02649	120	120	110	
1	TE02650	120	120	110	
3	TE02653	40	120	331	
2	TE02668	45	90	294	
2	TE02670	50	100	165	
2	TE02675	95	190	139	
2	TE02704	40	80	331	
2	TE02739	120	240	110	
15			1060	12.48 Totals	9.22

230-Volt Quantity	Element	Wattage each	Wattage total	Ohms of resistance each	amps
1	TE02649	120	120	441	
1	TE02650	120	120	441	
3	TE02653	40	120	1323	
2	TE02668	45	90	1776	
2	TE02670	50	100	1058	
2	TE02675	95	190	557	
2	TE02704	40	80	1323	
2	TE02739	120	240	441	
			1060	49.91 Totals	4.61

3-4. Materials. Tanis preheat systems are resistant to vibration, thermal and mechanical shock, and have an operational rating of -55°C to +200°C. They are designed for use in severe wind and moisture problem (SWAMP) areas and power plant environments. Connectors are environmentally sealed complying with industry standards using common tooling and termination processes.

Material and parts conform to approved designs, meet regulatory requirements for airworthiness applicable to the eligible products listed in our Parts Manufacturer Approval (PMA). Document control and Fabrication Inspection System (FIS) are maintained in compliance with Title 14 CFR 21.303(h).

3-5. Operation. Only operate the system with fluids at operational levels. Design is for continual operation in all weather and temperature conditions while in stand-by status. For the system to be of maximum benefit when temperatures are at or below 0°C (32°F), it should be in continual

use for a minimum of 6 hours before engine start. A complete preheat system will incorporate insulated engine cover, battery and avionics preheat. (For cold weather operations and starting procedures, reference Original Equipment Manufacturer (OEM) operating procedures and manuals, Rotorcraft Flight Manual and Supplements (RFMS), FAA Advisory Circulars (AC), and Tanis Aircraft RFMS TPG0003.)

3-6. Inspection and Cleaning. Processes are in accordance with Tanis ICA TCA0003, aircraft airframe, engine, and appliance manufacturer's recommendations.

Section 4. Installation

4-1. Installation Overview.

a. Verify system contents (Item List drawing 02874).
b. Review all supplied items, drawings and installing materials.
c. Weigh all components intended for installation before installing. Retain unused components and cabling for installed weight calculations.
d. Determine heat element locations.
e. Clean installation sites (Instruction 186).
f. Temporally locate elements using tape or other means.
g. Determine mounting locations for shoreline power plug, circuit protection, and system indicator light.
h. Route cabling from power connection to elements, adjusting cable lengths as required.
i. Install elements, connect, and secure cabling.
j. Perform "Systems Check" and "Sign Off."
k. Complete paper work.

4-2. Parts. The Heli-Preheat System item list (02874) contains a complete listing of supplied parts. Installation hardware, Adels, and finish materials are not included.

Additional installation hardware available through Tanis**:** Connectors and cabling, Adels (**Table 4-1.**). and modified Adels with .25 mounting holes, TU02847 40 lb. 8 inch heat stabilized cable tie, Click Bond™ CB9120 cable tie mount and CB92 installation kit. For firewall penetrations, use TG01056 Tanis Fireproof Grommet, MIL-C-38999, or MIL-DTL-5015, series crimp type disconnect.

TABLE 4-1. Adel Reference. (Sized for cables and connectors.)

Size	MS number	Application
1/8"	MS21919WDG-2	1 - 2 wire Tanis cable
1/4"	MS21919WDG-4	2 - 3 wire Tanis cable
5/8"	MS21919WDG-10	2 contact connector
3/4"	MS21919WDG-14	3 contact connector
1"	MS21919WDG-16	8 pin, -03 junction (small)
1 3/16"	MS21919WDG-19	12 pin, -05 junction (large)
1 1/2"	MS21919WDG-24	Circular Tanis Power Plug (02770, 02775)

4-3. Elements. Variations in case design may require substitution of listed elements (Section 1). Position elements to allow for direct lead and connector support.

a. Determine element locations. (Descriptions below and Figures 4-1. thru 4-9.)
b. Make trial routing of the cabling. (Section 5. Cabling.)
c. Clean element sites and install elements. (Reference supplemental bonding Instruction 186.)
d. Verify cable routing, connect elements, and secure cabling.


Do not connect elements to power until properly installed (Instruction 186).

4-4. Element Locations. Following narratives and **Figures 4-1 thru 4-9. Element Locations.**
(Note: Element and lead orientations may deviate from depictions.)

QTY	P/N	Element Installation (accessory location and orientation)
1	TE02649	MRGB, right side below oil fill, horizontally, lead outboard (Figure 4-1.).
1	TE02650	MRGB conical, left side above case split behind hydraulic distribution block, horizontally lead aft (Figure 4-2.).
2	TE02675	MRGB input housings, 1 each left and right, aft of hydraulic pump conical, bottom of case with lead facing inboard. (Figure 4-3.).
2	TE02653	Forward hydraulic tanks, 1 each left and right, aft side below nominal oil level, lead starboard to follow oil lines (Figure 4-4.).
2	TE02670	MO1 left forward side, 1 on each engine, below fuel control, lead down (Figure 4-5.).
2	TE02668	MO1 right aft side, 1 on each engine, opposite of starter/generator, lead outboard (Figure 4-6.).
2	TE02739	MO5 aft side lower area, 1 on each engine, lead starboard (Figure 4-7.).
2	TE02704	Engine oil tanks, left and right, horizontally below nominal oil level, between mounting bands leads aft (Figure 4-8.).
1	TE02653	TRGB, right underside aft surface of case, between casting support flanges, lead starboard to follow chip light wiring (Figure 4-9.).

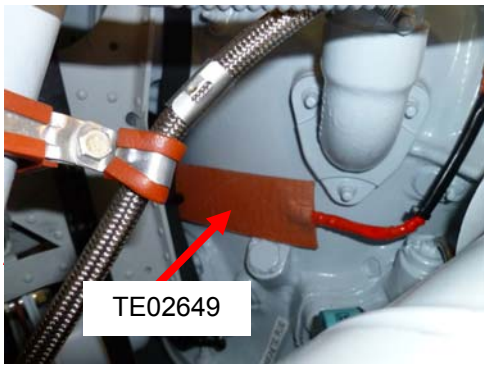


Figure 4-1.

Figure 4-2.

Figure 4-3.

Figure 4-4.

Figure 4-5.

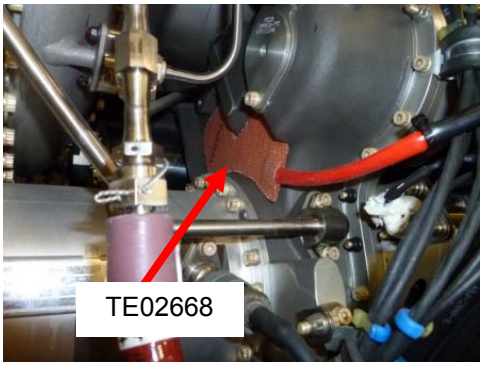


Figure 4-6.

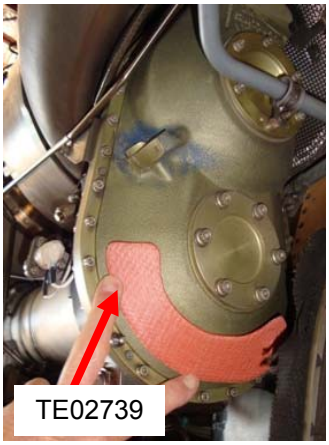


Figure 4-7.

Figure 4-8.

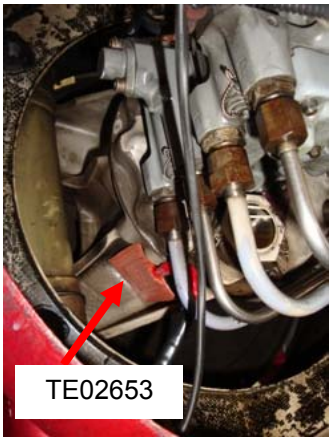


Figure 4-9.

FIGURES 4-1 thru 4-9. Element Locations

4-5. Cabling. For cable routing options, it is acceptable to shorten cables and re-terminate with appropriate connector (Instruction 192). Cables can be lengthened with additional cable or race

tracked to compensate for routing options. Use existing firewall and barrier penetrations whenever possible. If routing requires a new penetration of a fire barrier use Tanis Fireproof Grommet (TG01056) conforming to 14 CFR Part 23-1191/AC20-135, MIL-C-38999**,** MIL-DTL-5015, series crimp type disconnect, or appropriately approved fitting. Before penetrating composites, reference airframe manufacturer's procedure for proper penetration and potting procedures.

Caution: Do not allow junction or connectors to "free hang". Properly secure and support to avoid wire fatigue. Route cabling in a manner that ensures system components are not in close proximity to high heat sources. Pay particular attention to cabling connectors, junction blocks, fire sleeve connectors and cabling located in questionable areas. Appropriately identify cables and connections as required (AC43.13-1b Chapter 11).

4-6. Suggested Cable Routing. Route cabling between the power source and elements, adjusting the cable length as required, **FIGURES 4-10. thru 4-17. Cable Routing.** When planning the cable routing, use existing penetrations whenever possible. Junctions, and connectors can be mounted using an Adel, see **Table 4-1. Adel Reference.** for Adel size application.

1. Lay out the cabling.
2. Install shoreline power plug, circuit protection and indicator light on the right side aft of the baggage door just forward of bulkhead. Mount indicator light in conjunction with power plug. (Figure 4-10.).
3. Mount the main distribution power junction "A" on the vertical bulkhead just aft of the power plug (Figure 4-11.). Junction A distributes power to the battery heater. TRGB, junction B is located on the transmission upper deck, along with the indicator light, and capped spare lead.
4. From junction A:
    a. Route lead 02, battery heater cable vertically to the ceiling, across the ceiling to port, then forward to join the aircraft's battery cables from the left engine (Figure 4-12.). Follow these forward to the battery and connect to the battery heater system.
    b. Route lead 03, TRGB cable aft to the tail boom disconnect. Install an appropriate bulkhead fitting such as a MIL-DTL-5015 series crimp type disconnect. Continue aft through the disconnect, down the tail boom following the chip light wire to the TRGB element.
    c. Route lead 04, to the upper transmission deck. Run this cable vertically to the ceiling then forward to the forward baggage compartment bulkhead (Figure 4-13. and 4-14.). Use the existing penetration located in the center of the bulkhead, then transition forward along the passenger compartment ceiling to the upper deck penetration located just starboard of center. This penetration exits on the upper deck just forward and to starboard of the MRGB (Figures 4-15. and 4-16.). Lead 04 then connects to upper deck junction B, and B connects to the MRGB junction C. Junctions B and C are to be mounted on the right side of the MRGB on the existing bracket (Figure 4-15.).
    d. Lead 05 connects the Indicator light.
    e. Lead 06 is a spare lead that is to be capped.
5. From junction B, located on the transmission deck (Figure 4-15.):
    a. Lead 07 connects the MRGB junction C, which is mounted adjacent to junction B.
    b. Lead 08 passes through the left engine firewall in an area with existing wiring and connects to junction D.
    c. Lead 09 passes through the right engine firewall in an area with existing wiring and connects to junction E (Figure 4-15.).
    *Left and right engine junctions C and D, can be secured to the battery cables (Figure 4-16.) or mounted on or near the engine accessory gearbox,

MO1. Each of these junctions has three cables for connecting engine elements.
Penetrate the engine firewall using Tanis Fireproof Grommet TG01056, MIL-C-38999, or MIL-DTL-5015, series crimp type disconnect.

6. MRGB junction C co-located with junction B on the transmission deck (Figure 4-15.):
   a. Leads 1-21 connect to MRGB elements.
   b. Lead 22, transitions forward with hydraulic lines through the barrier to the two forward hydraulic tanks (Figure 4-17.).
7. Cable junctions can be secured using an Adel or cable tie around the junction body.
8. The cable from the circuit protected power source connects to the cabling.
9. Route cabling to each element and confirm locations.
10. Once cable routing has been confirmed, install the elements.
11. Allow element bonding sealant to cure (Instruction 186), connect elements to the cabling.
12. Secure cabling and element leads. Be sure to protect connections and appropriately secure. Do not leave connectors free hanging, support connector bodies to reduce wire fatigue at connector cabling interface point.

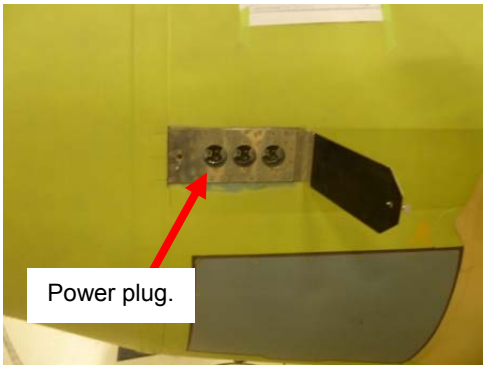


Figure 4-10.

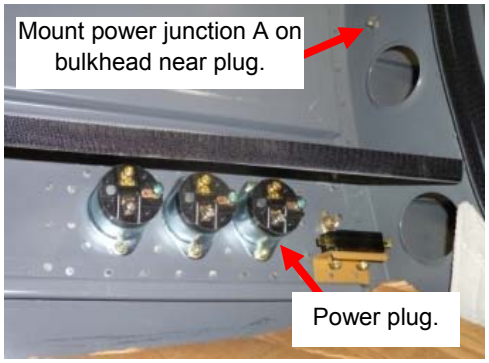


Figure 4-11.

Figure 4-12.

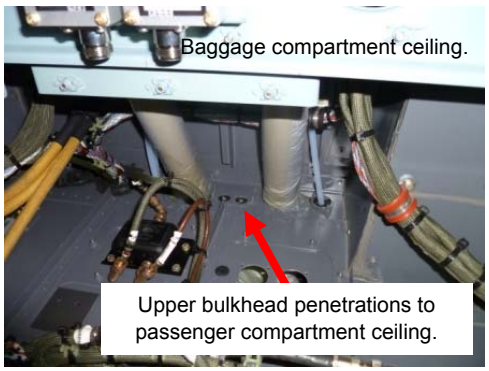


Figure 4-13.

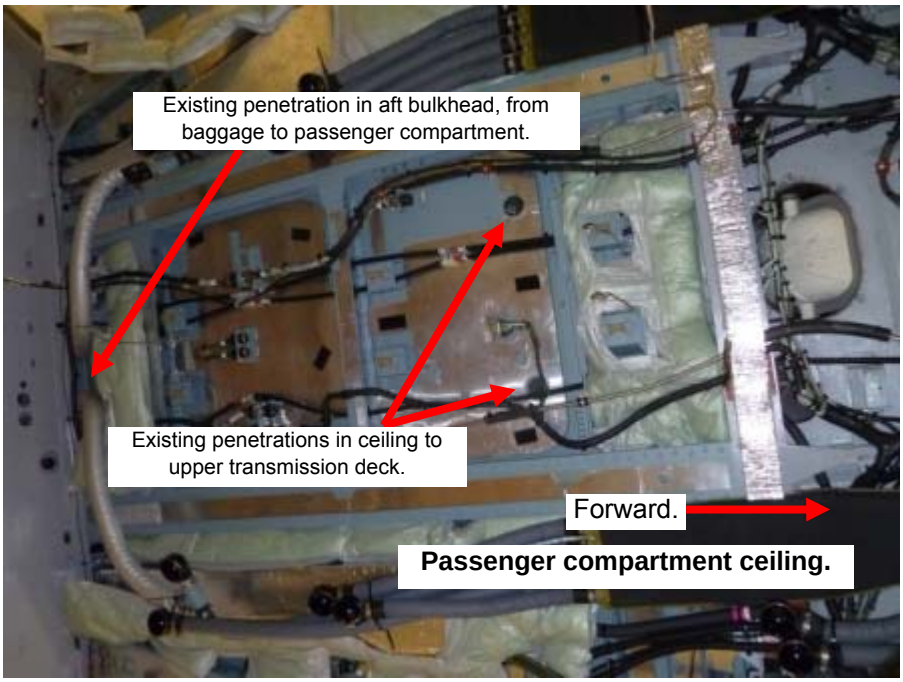


Figure 4-14.

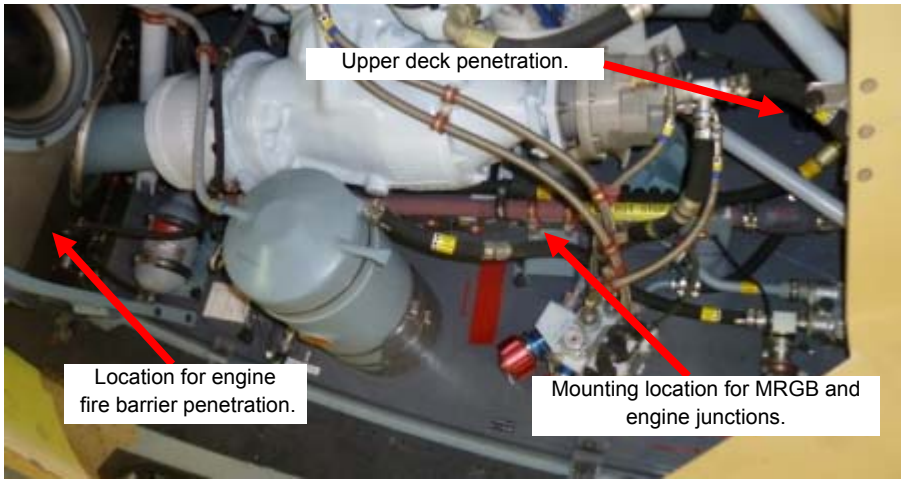


Figure 4-15.

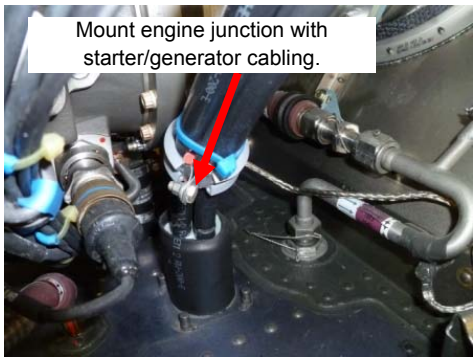


Figure 4-16.

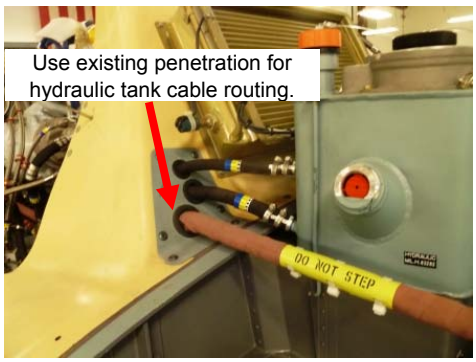


Figure 4-17.

FIGURES 4-10. thru 4-17. Cable Routing.

4-7. [Reserved].

Section 5. System Check

Verify elements are properly connected, all electrical components are secure, and installation is per AC43.13-1b Chapter 11, airframe manufacturer's procedures, and approved procedures set in place by the installing authority.

Proceed to **TABLE 5-1.**, check each item as it is completed with satisfactory results.

TABLE 5-1. Completion Check List.

Before Proceeding. Verify system is not powered or connected to a power source, all elements are properly connected, and bonding sealant is cured.

[√] Check the system as follows: (1 through 8)

1) [ ] Verify engine to airframe bonding is as per OEM requirements.

2) [ ] Verify Tanis system ground by checking for continuity between plug ground pin, engine, and airframe.

3) [ ] Verify there is no continuity between the power contacts and the airframe (ground).

4) [ ] Using an ohmmeter, measure resistance between the power pins and record here and on sheet 1 of Heli-Preheat System wire diagram drawing (02875). Total system: _____ resistance.

5) [ ] Connect the system to appropriate power. In about 30 minutes, the area next to the elements should feel warm. Do not touch hot elements they will burn bare skin.

6) [ ] File supplied Rotorcraft Flight Manual Supplement (RFMS) TPG0003, Instructions for Continued Airworthiness (ICA) TCA0003, and installation documents into existing Flight Manuals and Maintenance Logs.

7) [ ] Make a log entry to comply with 14 CFR Part 43.9.

8) [ ] Complete and return Registration / Warranty Card.

Section 6. Sign Off

The undersigned found the system installed and operating correctly. Date ___/___/___

Tanis Heli-Preheat System: _____ S/N: _____

Airframe: Manufacturer: _____ Model: _____

Engine: Manufacturer: _____ Model: _____

Aircraft: Serial Number: _____ Registration: _____

System test performed by: _____
(Signature)

_____
(Printed Name, Title and Certificate number, if applicable)

End